July 9, 1946. B. J. TRILLER 2,403,565

WINDOW CONSTRUCTION

Filed Aug. 11, 1943 3 Sheets-Sheet 1

Fig. 2.

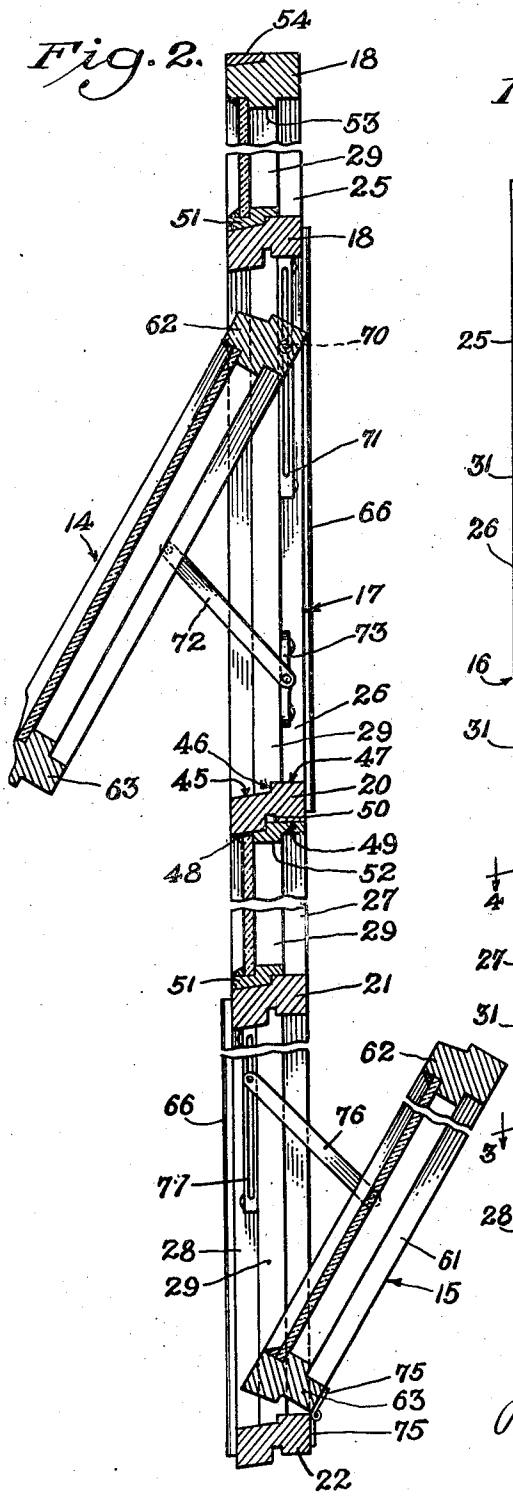
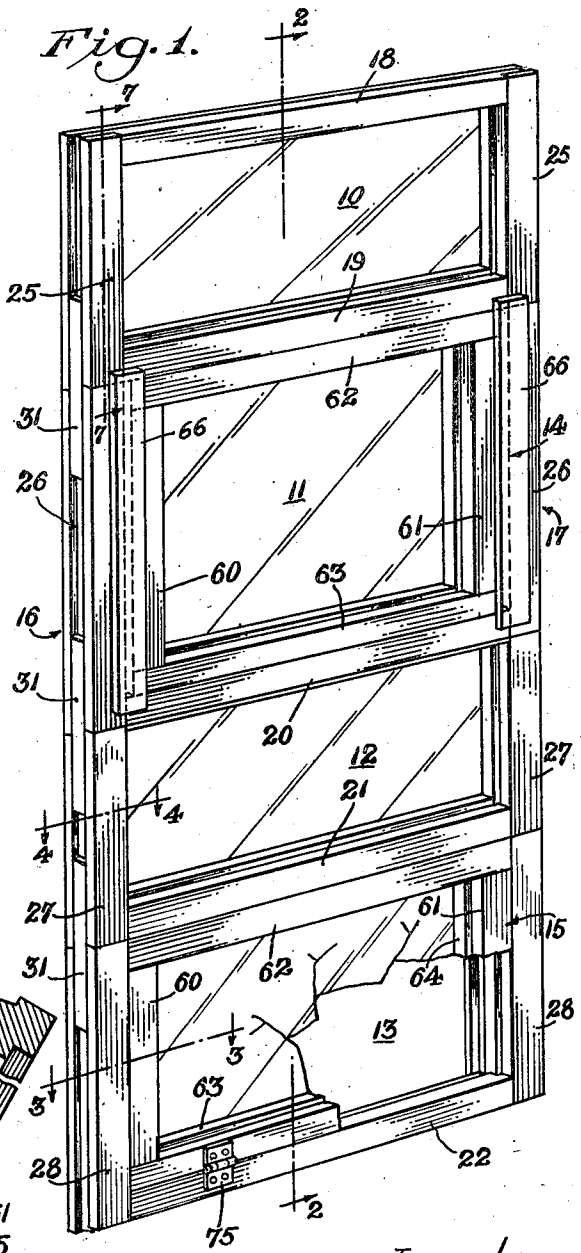



Fig. 1.

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July 9, 1946. B. J. TRILLER 2,403,565

WINDOW CONSTRUCTION

Filed Aug. 11, 1943 3 Sheets-Sheet 2

Fig. 3.

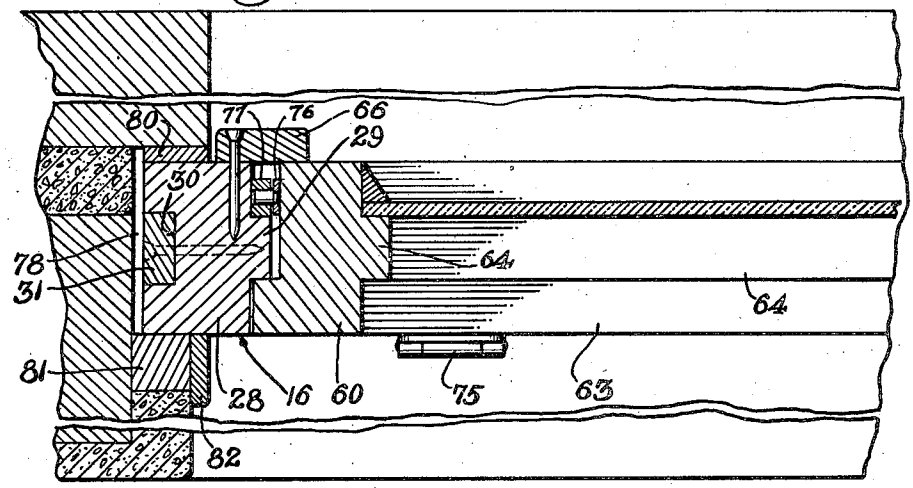



Fig. 4.

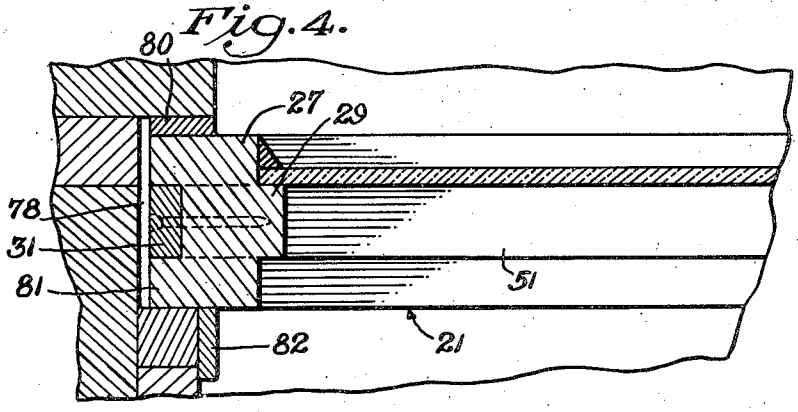
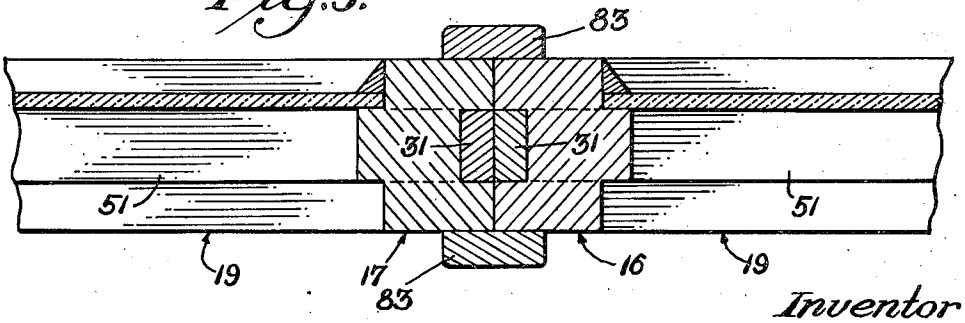



Fig. 5.

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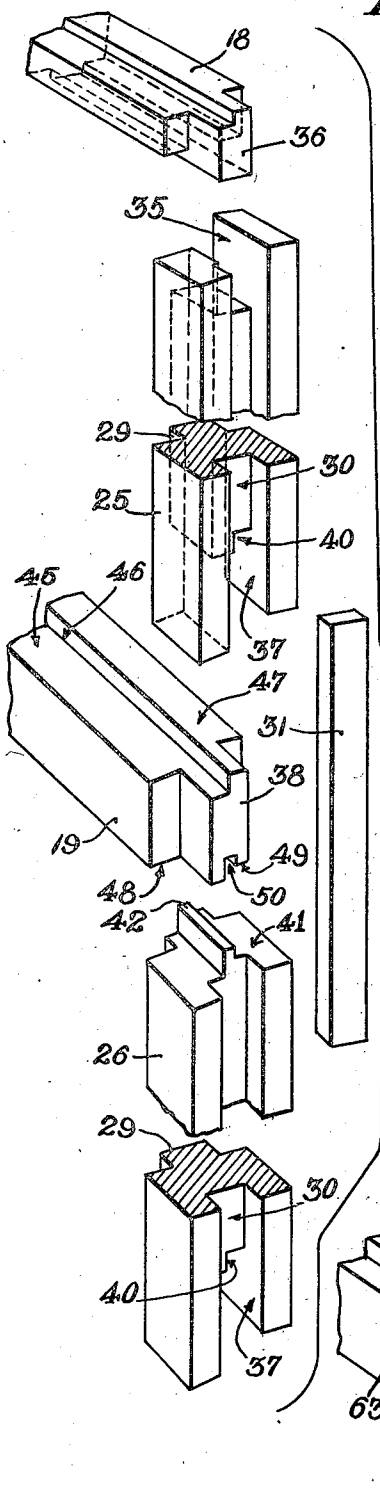
WINDOW CONSTRUCTION

Filed Aug. 11, 1943 3 Sheets-Sheet 3

Fig. 7.



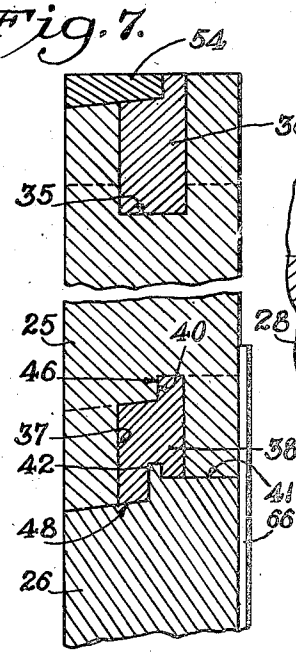




Fig. 6.

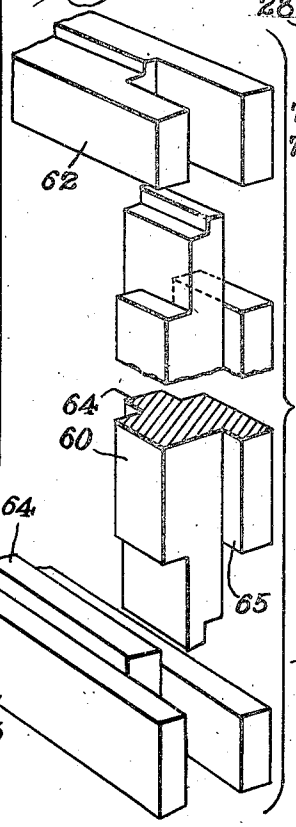



Fig. 8.

Fig. 9.

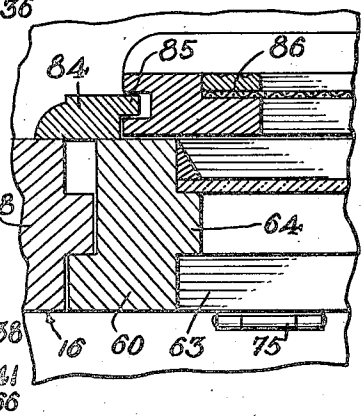
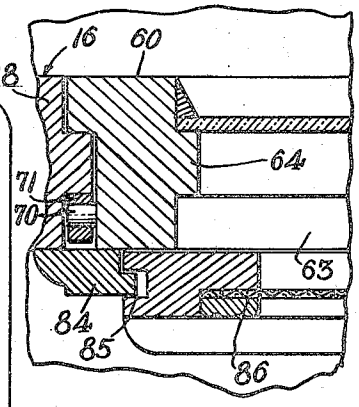



Fig. 10.

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2,403,565

# UNITED STATES PATENT OFFICE

2,403,565

## WINDOW CONSTRUCTION

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Application August 11, 1943, Serial No. 498,161

9 Claims. (Cl. 20—11)

1

The invention relates to improvements in window construction and more particularly to windows of the projected type.

One object of the invention is to provide a window structure of the above general character built up of standardized parts or sections adapted to be assembled in a multiplicity of different combinations to produce windows of a wide variety of different sizes and styles, thereby greatly reducing the number of different parts that must be manufactured and carried in stock to meet the demands of the trade.

Another object is to provide a window structure built up of standardized parts, the parts differing in form or size being relatively few in number and economical to manufacture.

Another object is to provide a window structure adapted to be made of wood and requiring only relatively short lengths of clear stock in its construction regardless of the overall size of the window, thus substantially reducing the cost of the material entering into the structure.

Still another object is to provide standardized parts for window construction which, by reason of their novel form, are particularly well adapted for economical manufacture by quantity production methods, which may be quickly and easily assembled and which provide a sturdy and durable window structure.

The foregoing objects and advantages, together with others not specifically mentioned, are attained in part by the novel method of constructing and asesmbling the window framework provided by the present invention. In accordance with this method the longer elements of the framework, such as side stiles, are built up of relatively short sections assembled in end-to-end relation and joined together by a key or spline. The abutting ends of adjacent sections are formed so that the sections together with the key, when assembled, define a blind mortise for receiving the tenoned ends of the cross members or muntin bars of the frame. By forming the ends of sections in this manner the sections can be shaped on a conventional tenoning machine, thus enabling the parts to be produced much more rapidly and at a materially lower cost than is possible when the parts are shaped on a mortising machine as has heretofore been the general practice. Moreover, the ends of the stile sections and the tenons of the muntin bars are shaped to interlock in a novel manner which greatly strengthens the assembled structure.

Other objects and advantages of the invention will become apparent from the following detailed

2

description of the preferred embodiment illustrated in the accompanying drawings in which:

Figure 1 is a perspective view of a window unit embodying the features of the invention.

Fig. 2 is a sectional view of the window unit taken in a vertical plane substantially on the line 2—2 of Fig. 1 but showing the ventilators in open positions.

Fig. 3 is a sectional view taken in a horizontal plane substantially on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken in a horizontal plane substantially on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary sectional view showing the method of joining window units in side-by-side relation.

Fig. 6 is an exploded perspective view of the side stile sections and muntin bars showing the formation of the parts for interlocking engagement.

Fig. 7 is a fragmentary sectional view of the side stile taken in a vertical plane substantially on the line 7—7 of Fig. 1.

Fig. 8 is an exploded perspective view of the ventilator frame adapted for use in the improved window structure.

Fig. 9 is a fragmentary horizontal sectional view showing the manner of screening an inwardly projected ventilator.

Fig. 10 is a fragmentary horizontal sectional view showing the manner of screening an outwardly projected ventilator.

In carrying out the invention I construct the improved windows in the form of units which can be installed singly or in any desired combination one above the other or in side-by-side relation, or both, as required. The window units themselves are constructed in a novel manner so that they may be produced economically in various styles and in convenient sizes. The styling is primarily concerned with the dimensions and arrangement of permanently glazed and ventilated openings or lights. Thus the typical window unit shown in Fig. 1 has four openings or lights 10, 11, 12 and 13 of which 10 and 12 are permanently glazed while 11 and 13 are fitted with ventilators 14 and 15 respectively. Ventilator 14 is of the outwardly projected type while ventilator 15 is adapted to be projected inwardly. It will be understood, of course, that this particular arrangement of lights is merely exemplary and that glazed or ventilated lights may be provided in any reasonable number and arranged in any desired combination.

The size of the window units may vary within wide limits from relatively small single light windows to large multi-light windows. In practice,

the maximum size of the window units is determined by the manner in which they are to be handled. Thus, if the windows are assembled at the factory for shipment complete, a maximum length of between eight and nine feet will ordinarily be found desirable. On the other hand, when assembled relatively close to the point of installation, much larger sizes may be built up if desired. Moreover, it will ordinarily be found sufficient to provide parts for assembling windows of about five different widths although the only limitations in this respect are those imposed by the demands of the trade.

Referring to Figs. 1 and 2 of the drawings, the frame structure of the improved window unit comprises side stiles 16 and 17 arranged in spaced parallel relation and connected by a plurality of cross members or muntin bars. In the particular window illustrated five such bars are provided, namely, a top bar 18, intermediate bars 19, 20 and 21 and a lower bar 22. Such bars may be manufactured in a variety of different lengths to provide for assembly into windows of different widths. Each of the muntin bars is formed with tenons at each end for assembly with the side stiles as will appear presently.

In accordance with the invention, the side stiles 16 and 17 are of sectional construction, that is, each stile is built up of a plurality of separately formed standardized elements or sections. These sections preferably conform in length to the height of the lights of which they form the sides. Thus, in the exemplary window each stile comprises a top section 25 forming one side of the light 10 and three additional sections 26, 27 and 28 forming sides of the lights 11, 12 and 13 respectively. Moreover, abutting ends of adjacent sections are shaped to form a mortise for receiving the tenon of the cross member or muntin bar forming the adjacent side of the light.

The sectional construction of the stiles is highly advantageous. In the first place, it permits these relatively long frame elements to be constructed of short lengths of clear stock which may be obtained from ordinary mill run lumber at materially less cost than long lengths of clear stock. Secondly, the sectional construction materially reduces the difficulties due to warping since the warping of one section is ordinarily counteracted by opposite warping of another section and the stile is maintained in proper shape. Thirdly, the sectional construction permits the stiles to be built up for assembly into windows of any desired length from a basic stock consisting of a relatively small number of parts of different sizes. This, of course, is desirable from both the manufacturing and distributing standpoint as the required parts can be manufactured economically and the quantity required to be carried in stock is reduced to a minimum.

It is also advantageous to form the stile sections so that each terminates in the plane of one of the muntin bars associated therewith. With this type of sectioning, the joint between adjacent stile sections is in line with the associated bar and therefore inconspicuous. A more important consideration is the fact that this construction greatly facilitates the shaping of the respective sections as will appear presently.

The stile sections 25—28 are all exactly alike in cross section. As will be seen by reference to Figs. 3 and 4, the inner face of each section is rabbetted along both edges to form a central rib or glass stop 29 extending longitudinally of the section. The opposite or outer face of the stile



section is formed with a longitudinally extending groove 30 dimensioned to snugly receive a rectangular key or spline 31 adapted to be seated in the groove in overlapping relation with the adjacent sections and thus hold the sections securely in assembled relation.

To provide for closing the upper end of the frame structure, the top section 25 of each stile is formed at its upper end with a transverse slot 35 (Figs. 6 and 7) dimensioned to receive a tenon 36 formed on the end of the top bar 18. The lower end of the section 25 and the corresponding ends of the other sections 26, 27 and 28 are formed with transverse slots 37 while the upper ends of the sections 26, 27 and 28 are shaped to interlock with the slotted section ends and to define therewith a mortise dimensioned to receive a tenon 38 of which one is formed at each end of the muntin bars 19, 20, 21 and 22.

The novel shaping of the section ends which form the mortise above referred to is an important factor in providing a strong joint between the sections. As will be seen by reference to Figs. 6 and 7, the slot 37 is of stepped formation, that is, the base is cut substantially deeper at one side than at the other so as to present a vertical shoulder 40 facing inwardly of the frame structure. The abutting end of the adjacent section is formed with a horizontal surface 41 terminating in an upstanding tongue 42 located substantially centrally of the section and projecting into the slot 37. On the opposite side of the tongue the end of the section is stepped down with respect to the horizontal surface 41 and is sloped downwardly and outwardly for weathering purposes.

Abutting stile sections, when assembled and locked together with a spline 31, thus define a blind mortise of a shape which would be extremely difficult and expensive to produce on a mortising machine. By reason of the sectional construction of the stile provided by the instant invention, the parts may be suitably shaped to form the mortise on an ordinary tenoning machine. The shaping operation may thus be performed rapidly and economically with ordinary production methods and relatively simple, inexpensive tools.

The tenons 38 of the bars 19—22 are shaped and dimensioned to fit snugly in the mortises defined by the abutting stile sections. The forming of the tenons is reduced to a simple operation since their cross sectional shape is the same as that of the adjacent sections of the bars. More particularly, the upper face of each bar is rabbetted along its outer edge to provide a downwardly and outwardly sloping weathering surface 45 connected by an upstanding vertical shoulder 46 with a horizontal surface 47. The lower face of the bar is formed with inclined and horizontal surfaces 48 and 49 parallel to the surfaces 45 and 47 and equally spaced therefrom. A longitudinal groove 50 at the junction of the surfaces 48 and 49 is adapted to receive the tongue 42 of the adjacent stile section and thus provide an interlock therewith.

When the parts are assembled as above described, the splines 31 impart lateral rigidity to the stiles. Due to the keying action of the tenons 38, torsional strains are effectually resisted. The coacting vertical shoulders or surfaces 40 and 46 on the tenon and the upper stile section and the correspondingly faced shoulders or surfaces on the tongue and groove connection between the tenon and the adjacent stile section are important factors in attaining this result.

The muntin bars 19—22 are especially shaped for coaction with the ventilators 14 or 15. By merely installing filler strips 51 and 52 as shown in Fig. 2 the edges of the opening defined by the bars may be conditioned for permanent glazing. The filler strips are adapted to fit snugly against the upper and lower faces of the bars and provide vertical stop shoulders alined with the inner and outer shoulders of the glass stops 29 of the side stile sections. When fitted with these filler strips the opening may be glazed in the usual way.

As it is usually undesirable to ventilate the top light of the window unit due to the difficulty of properly screening the same, the top bar 18 has its lower face rabbetted to form a permanent glass stop 53 alined with the stops 29 of the stile sections. The upper face of the bar 18 is shaped exactly like the corresponding faces of the other bars and is therefore adapted to interfit with the bottom bar of a window unit mounted directly thereabove. Thus, the window units may be mounted one above the other without requiring the installation of any special supporting structure or joining elements. When the window units are used singly or at the top of the assembled group, the top face of the bar 18 is preferably squared off by attaching thereto a suitably shaped filler strip 54.

For reasons of economy it is desirable to construct the stile sections in lengths which when assembled provide openings dimensioned to receive glass of the standard widths commonly supplied in the building trades. The top section 25 may be provided for only the narrower glass sizes, as for example, standard fourteen inch and twenty inch glass. For maximum flexibility the other stile sections may be provided in lengths suitable for the glass sizes above referred to and additionally for the next larger sizes such as twenty-six inch and thirty-two inch glass.

With top stile sections of two different lengths and the remaining stile sections of four different lengths, an almost unlimited variety of different sizes and styles of windows may be assembled. Moreover, at least twenty-three different variations of either height or style may be obtained without exceeding a maximum height of eight and one-half feet. It will be apparent therefore, that the novel method of construction provided by the present invention makes it possible to produce an extremely large variety of different sizes and styles of windows from a relatively small number of parts. Manufacturing costs are thus reduced to a minimum and jobbers are enabled to supply substantially all demands of the trade from a relatively small and inexpensive stock of parts.

Ventilators of the inwardly and outwardly projecting types above described may be supplied in two or more different heights and in as many widths as required by trade demands. Such ventilators may be manufactured economically in the required sizes in accordance with the construction contemplated by the present invention.

Referring to Figs. 2 and 9 of the drawings, the ventilator 15, as herein shown, embodies a rectangular frame comprising side members 60 and 61 having tongue and groove connections with top and bottom members 62 and 63. Each of these members has its inner face rabbetted to provide a centrally located glass stop 64 adapted for interior, exterior or double glazing. The outer faces of the members are shaped to coact with the adjacent faces of the side stiles and the muntin bars to form a weather tight seal therewith. Thus, the outer faces of the top and bottom members are formed complementary to the lower and upper faces of the muntin bars 18—22. The outer faces of the side members 60 and 61 are rabbetted to provide an outwardly facing stop shoulder 65 along the inner edge of the member for cooperation with the glass stop 29 of the side stile. The stop 65 is positioned on the inner side of the window framework so that the ventilator may be swung inwardly as shown in Fig. 2. A cover strip 66 (Fig. 3) on the outer face of the window frame acts to seal the joint between the ventilator and the frame.



The outwardly projected ventilator 14 is similar in construction to the ventilator above described comprising a rectangular frame built up of side members 60 and 61 and top and bottom members 62 and 63. In this case, however, the stop shoulder 65 is formed on the outer edges of the side members 60 and 61 to permit outward projection of the ventilator as shown in Fig. 2. The cover strip 66 is attached to the inner face of the window frame.

The ventilators 14 and 15 may be mounted in any preferred manner. When projected outwardly, the ventilators are preferably arranged to swing about a horizontal axis closely adjacent the top of the frame. The ventilator 14 is shown with this type of mounting which includes pivot pins 70 mounted on the side members 60 and 61 and adapted to engage in slotted guides 71 attached to the side stiles of the window frame. The guides are conveniently mounted in the inner rabbet of the side stile and thus effectually concealed when the ventilator is closed. Friction devices of well-known construction may be installed in the guides to restrain movement of the pivot pins and thereby hold the ventilator in adjusted position.

For projecting the ventilator outwardly, links 72 are pivotally connected between anchoring members 73 mounted on the window framework and the side members 60 and 61 of the ventilator frame. The members 73 may be in the inner rabbet of the side stile below the guides 71.

An alternative form of mounting is shown in connection with the ventilator 15. In this instance, hinges 75 swingingly secure the lower edge of the ventilator to the window framework while links 76 pivoted at their inner ends to the ventilator frame and having pins at their outer ends slidable in slotted guide members 77 guide the ventilator in its swinging movement and, through the medium of the usual friction devices, hold the ventilator in adjusted position. It will be understood, of course, that a pivoted mounting similar to that above described for the ventilator 14 may be used with inwardly projected ventilators if desired.

In the production of window units of the type herein described, the various parts may be manufactured in quantity and stored for use as required. Thus stile sections of a plurality of standard lengths are made up for stock. This can be done quickly and economically since the sections are all alike in cross sectional form and the ends of the sections are adapted to be shaped on a conventional tenoning machine. Likewise muntin bars and ventilator frame members are produced in the various sizes required and placed in stock until needed.

When a window unit is to be assembled, the required number of standard parts of the sizes required are withdrawn from stock. Ordinarily it will be found most convenient to assemble the

side stiles first. This is done by arranging the various sections in end-to-end relation, inserting the splines 31 and securing the parts together as by means of nails or the like. The muntin bars, including the top bar 18 and intermediate bars 19—22, are then assembled with the stiles by inserting the tenons of the bars in the mortises in the assembled stile structure. The ventilators 14 and 15 if required, are assembled and installed in the frame and the glass is applied to lights requiring permanent glazing. Thus, windows of any desired size or style may be built up quickly and economically from a relatively small stock of parts.

The window units thus produced are adapted to be mounted directly in the window opening of a building without the usual framing. Thus, as shown in Fig. 3, the window opening is formed with channels 78 adapted to receive the side stiles 16 and 17. Preferably these channels are dimensioned to provide sufficient clearance to allow the window unit to be accurately centered. Filler strips 80 and 81 may be installed to hold the unit in the desired position and a finishing strip 82 applied around the outer edge of the frame completes the installation.

The improved window units may be assembled in end-to-end or side-by-side relation as desired, to fit large openings. When installed side-by-side, as shown in Fig. 5, the joint between the adjacent window units is conveniently covered by mullions 83 which may be nailed or otherwise rigidly secured to the stiles of the window units.

When a light equipped with a ventilator is to be screened, the cover strips 66 are replaced with screen guides 84 as shown in Figs. 9 and 10. In the case of outwardly projecting ventilators, the guides 84 are attached to the inner face of the stiles 16 and 17. Thees guides are preferably simple wood strips formed with longitudinal tongues 85 engaged in grooves in the sides of the screens 86. Preferably the guides are extended upwardly beyond the ventilated light so that the screen may be raised for opening the ventilator.

For inwardly projected ventilators, the screen guides are attached to the outer face of the side stiles as shown in Fig. 9. As such screens do not need to be raised to open the ventilator, the guides may be terminated substantially at the muntin bar defining the upper edge of the opening.

It will be apparent from the foregoing that the invention provides a window structure of novel and advantageous character which is adapted to be built up of standardized parts capable of being assembled in a multiplicity of different combinations to produce a wide variety of different sizes and styles of window units. This improved method of manufacture embodying the use of standardized parts materially reduces the cost of the window structure and simplifies the problem of maintaining a reserve stock capable of meeting all demands of the trade.

The window units constructed in accordance with the invention are adapted to be made of wood and require only relatively short lengths of clear stock which are much less expensive than clear stock in the longer lengths heretofore used and employed in the construction of window framework. Moreover, the novel shaping of the parts for interlocking engagement produces a structure which is sturdy and not subject to objectionable warping. In general, the windows constructed in accordance with the invention are attractive in appearance, simple and inexpensive to build, and very versatile in their ability to meet the requirements of the trade for a wide variety of different types of window installations. Moreover, the window units are particularly well adapted for installation singly or in any desired combination.

I claim as my invention:

1. A window frame comprising, in combination, a pair of side stiles each consisting of at least two sections assembled in end-to-end relation, means connecting the sections of each stile to form a rigid unit including a spline extending over the sections and fitted into alined grooves formed therein, and top, bottom and intermediate cross members having tenons at opposite ends, the abutting ends of said sections forming mortises for receiving the tenons of the intermediate members.

2. A side stile for a window frame comprising, in combination, a plurality of sections assembled in end-to-end relation, a spline extending over two adjacent sections and fitted into longitudinal grooves in the respective sections, said spline acting to resist lateral strains imposed on the sections, and an interfitting slot and tenon connection between abutting ends of the sections adapted to resist torsional strains imposed on the sections.

3. A window frame comprising, in combination, cross members having tenons, a plurality of elongated sections assembled in end-to-end relation, a spline extending over two adjacent sections and fitted into longitudinal grooves in the respective sections so as to resist lateral strains imposed on the sections, the abutting ends of said sections cooperating to form a mortise for receiving the tenon of a cross member, said section ends being shaped to provide interlocking shoulders at opposite ends of the mortise for engagement with coacting shoulders on the tenons inserted therein whereby the assembled sections are strengthened to resist torsional strains.

4. A side stile for a window frame comprising, a plurality of sections assembled in end-to-end relation, adjacent sections being connected by a spline fitted into longitudinal grooves in the respective sections and having their abutting ends formed to provide a mortise adapted to receive and interlock with a tenon.

5. The method of constructing window frames which comprises, forming a series of standardized stile sections of predetermined different lengths and a series of cross members with tenons at each end, shaping one end of each section to interfit with the opposite end of each other section and to define therewith a mortise for the reception of a cross member tenon, cutting a longitudinal groove in one face of each section, assembling selected sections to form a side stile of the desired length, connecting the assembled sections together in end-to-end relation by inserting a spline bar in the grooves of adjacent sections, and assembling cross members with a pair of the side stiles by inserting the tenons thereof in the mortises formed by the stile section.

6. The method of constructing stiles for window frames which comprises, forming a series of relatively short stile sections of the same cross sectional shape and of predetermined different lengths, cutting a transverse slot in the corresponding ends of the sections, slotting the other ends of selected ones of said sections, forming the other ends of the remaining sections to interfit with the slotted section ends so as to define

a mortise therewith, assembling a selected group of sections in end-to-end relation with a section slotted at both ends disposed at the top of the assembly, and rigidly connecting the assembled sections together as a rigid unit.

7. In a window frame structure, in combination, a first stile section having a stepped slot cut transversely across one end, a second stile section adapted to abut the end of said first section and close the open side of the slot, a tongue formed on the abutting end of said second section and projecting into the slot in said first section, and a tenoned cross member adapted for assembly with said stile sections, the tenon of said cross member having one face stepped to fit the base of the slot in said first stile section and having a groove in its opposite face for the reception of the tongue on said second stile section to enable the assembled parts to resist torsional strains.

8. In a window frame structure, in combination, a tenoned cross member, a first stile section



having a slot cut transversely across one end to receive the tenon of said cross member, the base of said slot and the adjacent face of said tenon being shaped to provide a rabbetted splice between the parts, and a second stile section adapted to be assembled in abutting relation to the slotted end of said first section and the outer face of the tenon received in said slot, the abutting faces of said stile sections and said tenon being shaped to provide a tongued-grooved-and-rabbetted splice between the parts.

9. A frame structure for windows comprising, in combination, tenoned cross members, a plurality of stile sections assembled in end-to-end relation with each pair of abutting ends interfitted to define a mortise for the reception of the tenon of a cross member, the end portions of said sections and said tenon being shaped to enable the tenon to effectually resist torsional strains imposed on the sections.

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